MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

ECE1016 – COMPUTER & PROGRAM DESIGN

(All Sections / Groups)

8 OCTOBER 2016
2:30 P.M. – 4:30 P.M.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question Paper consists of 9 printed pages including cover page with 4 compulsory questions only.

2. Answer all questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) Malaysia's electric tariff rate for domestic consumer is given in Table Q1(a).

Table Q1(a)

Domestic Tariff	Rate (cent/kWh)
For the first 200 kWh (1-200 kWh) per month	21.80
For the next 100 kWh (201-300 kWh) per month	33.40
For the next 300 kWh (301-600 kWh) per month	51.60
For the next 300 kWh (601-900 kWh) per month	54.60
For the next kWh (901 kWh onwards) per month	57.10
The minimum monthly charges is RM3.00	

Write a complete C program to prompt the user to enter the total consumed units (kWh) for a month in integer format, and then calculate the electricity bill based on the tariff rate given in Table Q1(a). The program will then display the result (i.e., total amount needed to be paid in Ringgit Malaysia, RM) up to two significant digits after the decimal point. A sample output is shown in Figure Q1(a) below.

```
xubuntu@xubuntu-VirtualBox:~$ ./q1a
Enter total consumed units: 818

 Electricity bill:RM350.83
xubuntu@xubuntu-VirtualBox:~$
```

Figure Q1(a)

[12 marks]

(b) Write an appropriate C statement to accomplish each of the following tasks. Assume that each of these statements applies to the same program.

(i) Define a suitable structure type called `person` that stores a person's `age`, `salary`, and `name`.

[4 marks]

(ii) Declare a structure variable, `staff_1` of type `person` and initialize it with the values shown in Table Q1(b).

Table Q1(b)

Age	Salary	Name
35	2500.50	Ady

[3 marks]

Continued...

(c) Analyse the snippet of code shown in Figure Q1(c) and give the output of the code.

```
#include <stdio.h>

int main(){

    int n[4] = {23, 45, 0, 1};
    int *p, i, j, temp;
    p = n;

    for(i=0;i<4;i++){
        for(j=0;j<4;j++){
            if (*(p+i) < *(p+j)){
                temp = *(p+i);
                *(p+i) = *(p+j);
                *(p+j) = temp;
            }
        }
    }

    for (i=0; i<4; i++){
        printf("%d", *(p+i));
        printf("\n");
    }

    return 0;
}
```

Figure Q1(c)

[6 marks]

Continued...

Question 2

(a) Study the snippet of code shown in Figure Q2(a) to accomplish the given tasks.

```
float groupA[8] = {3.1,4.2,5.3,1.4,9.5,8.6};
float groupB[4][4] = {{1.9},{2.8,3.7},{4.6,5.5}};
float groupC[16] = {0.0};
float *gPtrA = groupA;
float *gPtrB = groupB;
```

Figure Q2(a)

(i) Determine the values of `*(gPtrA + 4)` and `*(gPtrB + 4)`.

[2 marks]

(ii) Store all the elements in the array `groupB` into array `groupC` using nested `for` loops. You may declare any additional variables that you need in your code.

[3 marks]

(b) Write a complete C program according to the requirements specified below:

0	1	1	1	1	1
-1	0	1	1	1	1
-1	-1	0	1	1	1
-1	-1	-1	0	1	1
-1	-1	-1	-1	0	1
-1	-1	-1	-1	-1	0

Figure Q2(b)

(i) Declare an array variable that can be used to store a 6×6 square matrix of integers.

[1 mark]

(ii) Use a nested `for`-loop to fill the left-to-right diagonal of this 6×6 square matrix with zeros, the lower left triangle with -1s, and upper right triangle with +1s as in Figure Q2(b).
Hint: Make use of the variation pattern in the index values of the successive array elements.

[6 marks]

(iii)Print out the content of this matrix as program output. Note that the border in the figure is for your reference only and need **NOT** to be drawn in your C program.

[3 marks]

Continued...

(c) Assuming `string1` contains the word "`Faculty`" and `string2` contains the word "`Engineering`", predict the resulting outcome of the following independent function calls, respectively:

(i) Value of integer variable `n` when `n = strlen(string1);` is executed

(ii) Value of integer variable `i` when `i = strcmp(string1, string2);` is executed

(iii) Value of `string1` when `strcpy(string1, string2);` is executed

(iv) Value of `string2` when `strcat(string2, string1);` is executed

[4 marks]

(d) Construct a complete C program that accepts two strings from the user and print them in the order of their lengths. The sample output is shown in Figure Q2(d).

```
xubuntu@xubuntu-VirtualBox:~$ ./q2d
Please enter the first string:Engineering
Please enter the second string:Faculty
The ordered strings are
Faculty
Engineering
xubuntu@xubuntu-VirtualBox:~$
```

Figure Q2(d)

[6 marks]

Continued...

Question 3

(a) Using C code, construct a function prototype for each of the following requirements:

(i) A function named **`total_character`** that takes in an array of character `data`, an integer `size` (size of array) and a character `check` as arguments. The function will calculate the total number of character in the array `data` that is identical with the character given in the argument `check` and return it at the end of function execution.

[2 marks]

(ii) A function named **`circle`** that takes in an integer `number` and a floating point number `radius` as arguments. If the value of `number` is 1, the function will calculate and return the area of the circle. If the value of `number` is 2, the function will calculate and return the circumference of the circle. For any other value of `number`, the function will return 0 at the end of function execution.

Area of a circle = 3.142 x *radius* x *radius*
Circumference of a circle = 2 x 3.142 x *radius*

[2 marks]

(b) Provide the function definition for the function prototypes defined in Part (i) and Part (ii) in Question 3(a) using C code.

[8 marks]

(c) Given partial C code in Figure Q3(c-1), implement the following using C code so that it will generate the output as shown in Figure Q3(c-2) when the C program is executed.

```
#include <stdio.h>
#include <string.h>

int main(){
   char data[ ] = "Multimedia";
   int number_i, length = strlen(data);
   float circumference;

   //Part 3(c)(i)
   //Part 3(c)(ii)

  printf("The total number of i in %s is %d\n", data, number_i);
  printf("The circumference is %.2f\n", circumference);
  return 0;
}
```

Figure Q3(c-1)

```
xubuntu@xubuntu-VirtualBox:~$ ./q3c
The total number of i in Multimedia is 2
The circumference is 31.42
xubuntu@xubuntu-VirtualBox:~$
```

Figure Q3(c-2)

Continued...

(i) Call the suitable function defined in Question 3(a) to determine the number of character 'i' in the array `data` and store it in the variable `number_i`.

[3 marks]

(ii) Call the suitable function defined in Question 3(a) to determine the circumference of a circle with a radius of five and store it in the variable `circumference`.

[2 marks]

(d) Analyze the C code in Figure Q3(d) and give the output on the screen at the end of the program execution.

```
#include <stdio.h>
#include <string.h>

void variableA(int inputa, int inputb, int *data){
   (*data)= inputa * inputb;
   inputb = (*data);
};

void variableB(int data[], int size, int factor){
   int i;
   for(i=1;i<size;i++){
      if (i%2==0)
         data[i] = factor+data[i];
      else
         data[i] = data[i] - factor;
   }
};

int main(){

   int result = 0, dataA = 5, dataB = 4, i;
   int process [6] = {0,2,4,6,8,10};

   variableA(dataA, dataB, &result);
   variableB(process, 6, 10);

   printf("Value of dataB is %d\n", dataB);
   printf("Value of result is %d\n", result);

   for(i=0;i<6;i+=2)
      printf("Value of process[%d] is %d\n", i, process[i]);

   return 0;
}
```

Figure Q3(d)

[8 marks]

Continued...

Question 4

(a) Convert the following pseudocodes to their equivalent C statements. The expected answers should be similar to Figure Q4(a).

Pseudocode:	If `speed` is greater than 100
C statement:	`if(speed > 100)`

Figure Q4(a)

(i) If `age` is less than or equal to 75 [1 mark]
(ii) If `num` is even [2 marks]
(iii) If `response` is either YES or Y [2 marks]
(iv) If `attendance` is greater than 80 and `marks` is less than 50 [2 marks]
(v) If `temperature` is positive and a multiple of 5 [3 marks]

(b) Figure Q4(b-1) shows a C program segment that uses a `do-while` loop to display a sequence of numbers as shown in Figure Q4(b-2) below:

```
i = 500;

do{
      printf("%d ", i);
      i /= 5;
}while(i>=4);
```

Figure Q4(b-1): C program segment

```
500   100   20    4
```

Figure Q4(b-2): Program output

Convert the `do-while` loop into other loop structures as indicated below:

(i) `while` loop [3 marks]
(ii) `for` loop [3 marks]

Continued...

(c) Write a complete C program that calculates the average height of 5 people. The program also determines the number of people whose height is above and below the average height, respectively. The general flow of the program is:

(i) By using a loop, the program first prompts the user to key in the heights of 5 people and store them to an array. Within the same loop, the total height is calculated by summing up all the heights in the array.

[4 marks]

(ii) The average height is then calculated by dividing the total height by 5.

[1 mark]

(iii)By using another loop, the program then compares each and every of the heights in the array with the average height in order to determine the number of people with height above and below the average height, respectively. These results will be printed at the end of the program execution.

[4 marks]

A sample of the output is shown in Figure Q4(c).

```
xubuntu@xubuntu-VirtualBox:~$ ./q4c
Enter height of Person 1: 1.56
Enter height of Person 2: 1.3
Enter height of Person 3: 1.2
Enter height of Person 4: 1.34
Enter height of Person 5: 1.5
Average: 1.38
No. of those above average: 2
No. of those below average: 3
xubuntu@xubuntu-VirtualBox:~$
```

Figure Q4(c)

End of Paper